Amendments to the Specification:

Please **amend** the **Title of the Invention**, as follows:

GOLF CLUB HEAD ~~HAVING A LIGHTWEIGHT CROWN~~

Please **replace** the **Abstract of the Disclosure** with the following amended paragraph:

The present invention resides in a wood-type golf club head having ~~a high COR that is durable and has desirable acoustic qualities. The club head includes~~ a body ~~portion~~, a striking face and a crown ~~forming a hollow cavity of at least 150 cc in volume~~. The body ~~portion~~ defines a front opening and an upper opening, and it includes a sole and a side section that extends rearward of the front opening. The striking plate is secured to the body ~~portion~~, enclosing the front opening. While partially assembled, final weighting and/or other attachment of other members to the inner surface of the club head can be preformed, as desired. The crown is secured to the body portion, enclosing the upper opening. A surface veil ~~may also be provided about~~ is disposed atop a junction of the crown and body. The crown has a maximum thickness no greater than about 2 mm. ~~The density of the crown is less than the density of the body portion.~~ In a preferred embodiment, [[At]] at least one of the striking plate and the crown is attached to the second portion by adhesive bonding~~, and the golf club head has a maximum coefficient of restitution of at least 0.80~~.

Please **replace** paragraph **[0014] and [0015]** with the following amended paragraph:

[0014] The present invention provides a wood-type golf club head having ~~high COR that is durable and has desirable acoustic qualities. The club head includes~~ a body ~~portion~~, a striking face and a crown ~~forming a hollow cavity of at least 150 cc in volume~~. The body ~~portion~~ is formed from a material having a density of at least about 4 g/cm^3 and defines a front opening and an upper opening. The body has a shoulder disposed around a periphery of the upper opening, a recessed support extending from the shoulder and positioned adjacent to the upper opening, a sole and a side section that extends rearward of the front opening. ~~The body portion preferably includes a recessed support extended from a shoulder and positioned adjacent to the upper~~

~~opening to support the crown.~~ The striking plate is secured to the body ~~portion~~, enclosing the front opening. The crown is secured to the body ~~portion~~ and is supported by the recessed support, enclosing the upper opening. The crown has a maximum thickness no greater than about 2 mm and incorporates composite material having a density between 1 g/cm^3 and 2 g/cm^3. ~~The density of the crown is less than the density of the body portion. At least one of the striking plate and the crown is attached to the second portion by adhesive bonding, and the golf club head has a maximum coefficient of restitution of at least 0.80.~~ The crown has a first portion sized to sit on the recessed support of the body such that a side edge of the first portion is proximate to the shoulder of the body, thereby forming a junction between the first portion of the crown and the body. The club further includes a surface veil secured atop the junction.

[0015] In ~~a detailed aspect of~~ a preferred embodiment, the ~~body portion is preferably formed of a metal having a density of at least about 1.8 g/cc and preferably at least about 4 g/cc. The~~ crown ~~has a density between 1 g/cc and 2 g/cc~~ includes plies of composite material having a fiber areal weight of between 20 g/m^2 and 200 g/m^2, and the weight of the crown is less than the weight of a similar sized piece formed of the material of the body. At least one of the striking plate and the crown is attached to the body by adhesive bonding.

Please **delete** paragraphs **[0016] through [0019].**

Please **replace** paragraph **[0023]** with the following amended paragraph:

[0023] FIG. 3 is a cross-sectional view of Section A ~~a junction of the crown and body portion~~ of the club head of FIG. ~~1~~ 2.

Please **replace** paragraph **[0025]** with the following amended paragraph:

[0025] FIG. 5 is a cross-sectional view of Section B ~~of a junction of the crown and the body portion~~ of the club head of FIG. 4.

Please **replace** paragraphs **[0030] to [0032]** with the following amended paragraphs:

[0030] FIG. 8 is a partially exploded perspective view of a third preferred embodiment of a golf club head in accordance with the invention, depicting a crown, including a surface veil covering a top portion of the club head, separated from a body ~~portion~~.

[0031] FIG. 9 is a partially exploded perspective view of a fourth preferred embodiment of a golf club head in accordance with the invention, depicting a crown, including a surface veil covering a junction between the crown and body ~~portion~~, separated from a body ~~portion~~.

[0032] FIGS. 10A–10C are cross-sectional views of a junction of the crown and the body ~~portion~~ of the club head of FIG. 9, depicting exemplary steps for applying the surface veil.

Please **replace** paragraphs **[0033] to [0039]** with the following amended paragraphs:

[0033] With reference to the illustrative drawings, and particularly FIG. 1, there is shown a golf club head 10 having a crown 12 formed of composite material not yet attached to a body 14 of a golf club head 10, to enclose an opening 16. The body 14 is formed of ~~any~~ a metal, such as an aluminum, steel or titanium alloy, for example. The body 14 may be cast to form a front 18, a sole 20, a top portion 22 and a side portion 24. At the front 18, a striking plate 26 is separately formed and attached to the front of the body 14 in any manner known to those skilled in the art (see FIGS. 4 and 5). The striking plate 26 may be formed of a different alloy or grade of the same metal as the body 14, or the striking plate 26 may be a different metal or a composite material, as desired. If metallic, the striking plate 26 is welded to the front 18; if made of a composite material, the striking plate 26 may be adhesively bonded to the front 18.

[0034] In alternative embodiments, the ~~metal~~ body 14 may comprise three or more portions welded together, where the portions are forged, cast or stamped pieces or any mix thereof. Or, the body 14 may be cast except for a separate sole plate that is attached in the appropriate location. The body 14 may also include one or more attached members, such as weighting elements, that may comprise a metal or other material having a different density than the material of the rest of the ~~main~~ body 14.

[0035] The side portion 24 extends rearwardly of the front 18 and has a toe region 28, a rear region 30 and a heel region 32 formed above the sole 20. A hosel 34 is provided at the heel end of the body 14 for attachment of a shaft (not shown). The top portion 22 of the body 14 extends rearwardly from an upper edge 36 of the front 18 of the club head 10, above the side portion 24. Thus, the sole 20, top portion 22, front 18 and side portion 24 combine with the crown 12 to form a hollow body 14 having a volume of at least 150 cubic centimeters (cc) and up to 500 cc.

[0036] As more clearly shown in FIG. 2, the ~~cast~~ body 14 includes an annular rim 38 at the opening 16 in the top portion 22 that includes a ledge 40 that acts as a support member for the crown 12. Alternatively, the support member may comprise a plurality of tabs. The size and shape of the support member is preferably chosen to minimize the required overlap with the crown 12 or the mating surface area of the crown 12 and top portion 22.

[0037] Referring to FIG. 3, the rim 38 extends a distance D_1 of at least 7 mm rearward from the upper edge 36 of the front 18, with a shoulder 42 defining the ledge 40 which preferably extends an additional distance D_2 of at least 7 mm. The rim 38 preferably extends between 8 mm and 12 mm, and more preferably about 10 mm, from the upper edge 36 while providing advantages of the present invention. Similarly, the ledge 40 preferably extends between 8 mm and 12 mm. Preferably, an adhesive such as Hysol® two part epoxy 9460 or, alternatively, 3M® DP460NS, is used to attach the crown 12 onto the ledge 40, abutting the shoulder 42.

[0038] The opening 16 in a central section 44 of the top portion 22 comprises at least 25% (see FIG. 6), and preferably comprises at least 60%, of the total area of the top portion 22. More preferably, the opening 16 is at least 75% of the total area of the top portion 22. Thus,

there is a significant weight savings afforded by replacing a similarly sized metal crown with the crown 12 described herein. The difference in weight between the metal and composite materials may be redistributed in the club head 10 to manipulate the center of gravity of the club head 10, such as by providing a weight pad 46 on an interior surface 48 of the sole 20 as shown in FIG. 4. Such a weight pad 46 is preferably formed of a softer metal of lower density than the material of the body 14 of the club head 10 and is attached to the sole 20; although, a weight pad 46 may alternatively be cast as a thickened portion of the sole 20.

[0039] Tables I and II show exemplary materials for the body 14 of the club head 10 and the crown 12, respectively. The body 14 preferably has a thin-wall construction, wherein the thicknesses of the sole 20 and side portion 24 is in the range of 0.8 mm to 2 mm and the top portion 22 thickness is in the range of 0.7 mm to 2 mm. The thickness of the front portion ~~16~~ 18 is preferably in the range of 1.5 mm to 4 mm. The crown 12 is also of a ~~thin~~ thin-wall construction, having a thickness T_c of no more than about 2 mm, preferably less than 1.5 mm, and more preferably about 1 mm. In the preferred embodiment of FIGS. 1-3, the thickness of the top portion 22, including the ledge 40, is approximately 1 mm so that the shoulder 42 extends about 2 mm from an outer surface 50 of the top portion 22 to an inner surface 52 of the ledge 40.

Please **replace** paragraphs **[0040] to [0051]** with the following amended paragraphs:

[0040] A golf club head 10 constructed in this manner advantageously improves durability since the junction of the striking plate 26 with the top portion 22 is subject to a lesser force at impact with a golf ball. The use of the crown 12 on the metal body 14 also increases COR. Further, the golf club 10 head having a crown 12 on a metal body 14 advantageously provides acoustic qualities judged to be more appealing to golfers.

[0041] In one club head 10 tested by the inventors, a 300 cc hollow body 14 was formed of a stainless steel alloy. A large area, 1 mm thick crown 12 was formed of 5 plies including 4 plies of a uni-tape of standard modulus graphite and 1 ply of a woven graphite cloth. The 4 plies of uni-tape were assembled at 0, 45, -45 and 90 degrees and had a fiber area weight (FAW) of about 140 grams per meter squared (g/m^2). The standard modulus is approximately 33 Mpsi for the fiber with about 600 Kpsi tensile strength. In comparison, an alternative, and more

expensive, ultrahigh modulus fiber (satellite grade) comprises about 57 Mpsi. FAW may range from about 20 to 200 g/m^2, and preferably the composite plies for the crown 12 are in the range of 70 to 180 g/ m^2. More preferably, the composite plies for the crown 12 are in the range of 120 to 160 g/ m^2.

[0042] The resultant mass of the crown 12 is about 10 grams. This is about a 50% reduction in the mass compared to a crown 12 formed of the steel material of the rest of the club head 10. The calculations of the weight savings must take into account the presence of the ledge 40 with the crown 12, as well as the adhesive. Generally, the weight savings is at least 20% compared to an all metal body 14. The weight pad 46 may then be added to achieve a total mass approximately equivalent to an all metal body 14.

[0043] The crown 12 may alternatively be formed of more or less plies, and instead of the top ply being a woven graphite cloth, the top ply may be another uni-tape that is painted to achieve the desired aesthetic look of the club head 10. The top ply is preferably oriented at 0 or 90 degrees. The molding of the crown 12 may be performed using methods known to those skilled in the art and preferably comprises a dual mold to achieve a net shape that requires little finishing and flash removal prior to its attachment to the body 14 of the club head 10.

[0044] Another club head 10 tested by the inventors utilized a titanium alloy body 14 for the club head 10, with a crown 12 formed of a thermoplastic material. Preferably, the crown 12 is an injection-molded nylon or polyphenylene sulfide (PPS) material, using 3M® DP460NS adhesive for attachment to the metal body 14. The nylon may be used with or without glass or carbon fiber and preferably has a density between 1 g/cc and 1.7 g/cc. Alternatively, the PPS material maybe used with or without glass or carbon fiber and preferably has a density between 1.3 g/cc and 2.0 g/cc. Replacing the crown 12 of the titanium alloy club head 10 results in about a 35% savings in weight. In general, the weight savings is at least 15% compared to an all metal body 14.

[0045] The replacement of the crown 12 of a metal club head 10 provides the advantage of weight savings and/or redistribution of mass to the sole 20, for example. A weight pad 46 on the sole 20, or elsewhere on the body 14, may be integrally formed or be a separately formed and

attached mass, the resulting weight being comparable to an all metal club head 10 of the same volume.

[0046] Because of the access afforded by the opening in the top 22 of the club head 10, a rear of the striking face 54 is accessible during manufacture for the addition of a face reinforcing member 56 formed of metal or composite material and securely attached behind the sweet spot, as shown in FIG. 7. Thus, a thin titanium alloy striking face 54 can be strengthened or otherwise enhanced in performance. Similarly, any number of additional members may be attached elsewhere on any ~~inner~~ interior surface 48 of the club head 10.

[0047] The use of the aforementioned materials, composite or plastic, for the crown 12 allows the use of a lighter weight material that may result in the top 22 of the club head 10 having a stiffness similar to the heavier, metal sole 22. This stiffness matching may be advantageous for high COR golf club heads.

[0048] The golf club head 10 can be assembled with the aid of adhesive bonding. In a preferred method of manufacture, the striking face 22 is securely attached to the body 14, enclosing a front opening. While partially assembled, final weighting and/or other attachment of other members to the ~~inner~~ interior surface 48 of the club head 10 can be preformed, as desired. Next, the crown 12 is secured in place, forming the top section 22 of the club head 10. Preferably, the crown 12 is of a material having a density less than 2 g/cc ~~has~~ with a thickness no greater than 2 mm. At least one of the crown 12 and the striking plate 26 is attached by adhesive bonding to the opening 16 in the body 14. In one embodiment, the mating surfaces of the crown 12 and ledge 40 may be prepared by sandblasting to enhance bonding. Other steps may be performed in order to prepare and/or finish the final club head 10, as known to those skilled in the art.

[0049] With reference now to FIGS. 8 and 9, the golf club head 10 may further include a surface veil 58 sized to cover the junction between the crown ~~portion~~ 12 and the body ~~portion~~ 14. The surface veil 58 can include plies of composite material. As shown in FIG. 8, the surface veil 58 can be sized to entirely cover the junction between the crown 12 and the body ~~portion~~ 14 and the outer surface 50 of the crown. Alternatively, as shown in FIG. 9, the surface veil 58 can be

configured to be disposed about the crown 12 to cover the junction between the crown and the body ~~portion~~ 14. The surface veil 58 aids in preventing cracking and peeling of the club head's surface. In the exemplary embodiments, the surface veil 58 is formed of two additional plies of the material used with the crown ~~portion~~ 12, as discussed above. In other preferred embodiments, the crown ~~portion~~ 12 is formed of a first lightweight material, as discussed above, e.g., carbon fiber plies, and the surface veil 58 is formed of a second lightweight material, such as discussed above, e.g., a glass composite.

[0050] With reference now to FIGS. 10A–10C, an exemplary method of attaching the surface veil 58 is depicted. As shown in FIG. 10A, an obtuse depression 60 is provided at the junction between the crown ~~portion~~ 12 and the body ~~portion~~ 14. The depression 60 is preferably formed by providing a taper to at least one of the side edge 62 of the crown ~~portion~~ 12 and the shoulder 42 of the body ~~portion~~. In the exemplary method, both the side edge 62 and the shoulder 42 are tapered, defining an angle θ, which is preferably greater than 90 degrees and less than 180 degrees. The surface veil 58 is attached above the junction between the crown and the body 14 such that it at least partially fills the depression 60 (FIG. 10B). Once in place, the outer surface of the club head 10 undergoes additional treatment, e.g., grinding and/or sanding, to provide a smooth, finished surface (FIG. 10C).

[0051] It should be appreciated from the foregoing the present invention provides a golf club head having a high COR that is durable and has desirable acoustic qualities. The club head 10 includes a body ~~portion~~ 14, a striking ~~face~~ plate 26 and a crown 12 forming a hollow cavity of at least 150 cc in volume. The body ~~portion~~ defines a front opening and an upper opening, and it includes a sole 20 and a side section 24 that extends rearward of the front opening. The striking plate 26 is secured to the body ~~portion~~ 14, thereby enclosing the front opening. While partially assembled, final weighting and/or other attachment of other members to the inner surface of the club head 10 can be preformed, as desired. The crown 12 is secured to the body ~~portion~~ 14, thereby enclosing the upper opening. A surface veil 58 may also be provided about a junction of the crown 12 and the body 14. The crown 12 has a maximum thickness no greater than about 2 mm. The density of the crown 12 is less than the density of the body ~~portion~~ 14. Beneficially, the golf club head 10 has a coefficient of restitution of at least 0.80.